

# Occupational Injury Prevention Guidelines

U.S. Army Public Health Command (Provisional) Injury Prevention

## Preventing Work Related Injuries

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## **Introduction**

To prevent musculoskeletal injuries in the work place it is helpful to know a little about how ergonomics applies to the work place and the worker as well as risk factors for Work-related Musculoskeletal Disorder (WMSD).

This document provides a high level overview of ergonomics, WMSD, and factors to consider such as safe lifting, and attention to preventing slips trips, and falls.

## **Why You Need to Know About Work Related Injuries**

Work related injuries are often caused by a poor ergonomic situation. Ergonomics simply means noticing the environment, equipment, tasks and people. It means designing the environment, tasks, and equipment to match a person's abilities.

Whenever your physical abilities are exceeded you are at risk for injury.

Servicemembers can get more done and get jobs done quicker when the requirements match their abilities. The quality of their work is also better. The Servicemember is safer, less fatigued, less prone to errors, and less likely to become injured.

Ergonomics help Servicemembers work better, faster, and safer.

Ergonomics: The field of study that seeks to fit the job to the person, rather than the person to the job. Includes the evaluation and design of workplaces, environments, jobs, tasks, equipment, and processes in relationship to human capabilities and interactions in the workplace. (DoDI 6055.1)

## **Work-related Musculoskeletal Disorders (WMSDs)**

Work-related musculoskeletal disorders (WMSDs) are disorders and diseases of the muscles, tendons, and/or skeletal system that are caused, or made worse, by one's work. Symptoms include cumulative trauma, repetitive motion, and overuse disorders. Examples of WMSDs are low back pain, carpal tunnel syndrome, and tennis elbow. Note however, that these are only considered a WMSD if the symptoms are associated with work. For example, tennis elbow can occur to office workers who place their mouse in a position so they have to reach up and at arms length to use it.

There are seven work-related injury risk factors that can contribute to the development of a WMSD. These are risk factors you can often identify and correct. Being aware of the risks and making changes can make the work safer and better.

### *Position or Non-Neutral Postures*

Extreme bending or twisting of the wrist and repeated shoulder/elbow elevation are typical non-neutral postures that can expose the worker to ergonomic hazards. Some common causes are inadequate workspace, poor hand tool design, and manual lifting.

Examples: Using pliers and cutting with a knife: excessive bending or twisting of the wrist and continued elbow or shoulder elevation

### *Repetition*

Repetitious work may not allow sufficient recovery time for muscles, tendons, and nerves. "Rub points" can develop causing damage that is beyond the body's natural ability to repair. Machine-paced and production-based incentives can contribute to the problem.

Example: Grasping and pulling materials, using tweezers and/or forceps, and inserting small parts with fingers

### *Duration*

Working in the same position for a long period of time (static work) decreases the blood flow to the contracted muscles. Raising the arms overhead (e.g., painting a ceiling) or twisting to see something can be problematic.

### *Force or Forceful Exertions*

Force is the amount of work expended to perform an occupational task. Forceful exertions due to weight, friction, or posture can stress muscles and tendons beyond their capacity. Damage can occur to the muscles, tendons, ligaments, cartilage, bones, and nerves. Using force in combination with repetitive work in non-neutral postures is especially dangerous.

Example: Manipulating controls and levers and using a screwdriver.

### *Mechanical Compression*

Pressure points from sharp ridges, small handles, or the act of leaning against the sharp edge of a table can damage the underlying muscles, nerves, tendons, and blood vessels.

Example: Using the palm to apply pounding forces (using the palm like a hammer) and tool handles pressing into the palm (e.g., a screwdriver)

### *Vibration*

Vibration risk factors can be intensified by excessive duration and a work environment that does not allow for adequate work-rest cycles. There are two types of vibration risk:

- Whole body vibration (WBV), e.g. helicopter pilots
- Localized vibration, e.g. hand tool operators

### Whole Body Vibration (WBV)

"Whole Body Vibration (WBV) and repeated impact exposures affect approximately 6 million workers in the US who regularly operate trucks, buses, heavy equipment, forklifts, helicopters, fixed wing aircraft, small marine craft, and ships...Evolving military strategy and operational demands create increased use of high-speed vessels, including newer vessel design and acquisition, and increased duration of air support missions, particularly for rotary wing aircraft." (Harrer, et al, *Measurement and Evaluation of Whole Body Vibration for MH-60S Pilots*)

WBV poses safety concerns due to fatigue and impaired performance. Permanent damage to the body may result from WBV. Adverse health effects include bone and cartilage degeneration, digestive and reproductive system disorders, and nervous system disturbances.

### Localized Vibration

Vibration from pneumatic hand tools or tools that shake (e.g., a sander) disrupt the blood flow causing damage to blood vessels in the fingers and to nerves in the wrist. During prolonged exposure, permanent tissue damage can occur. Raynaud's syndrome, commonly known as the "vibration white finger syndrome," can develop as a result of chronic constriction of the blood vessels.

### *Temperature*

Working in cold temperatures impairs blood circulation in the extremities. Fingertips become numb, resulting in decreased sensation and excessive expenditure of force because of lack of feeling. If tissue damage occurs, the impaired blood flow impairs the healing process.

### **Risk Factors for Work-related Musculoskeletal Disorders**

- Sustained or non-neutral working postures
- Restrictive workstations (inadequate clearances)
- Improper seating and/or support
- High-frequency and/or high-speed work
- Repeated use of same muscle-tendon group
- Repeated use of smaller, weaker muscles (e.g., pinch grip)
- Force application, especially in a non-neutral posture
- Tool design (e.g., inadequate padding forces worker to use tool in a non-neutral posture)
- Vibration (from pneumatic tools or driving heavy trucks)
- Machine-pacing and production-based incentives
- Work pace near maximum
- Cold or wet work; temperature extremes
- Poorly fitting gloves that reduce grip strength
- Heavy lifting
- Improper workstation height

### **Ergonomic Solutions**

The primary method of preventing and controlling exposure to WMSD hazards is through effective design (or redesign) of a job or worksite. The following is a list of intervention methods, in order of priority:

### *Process Elimination*

Elimination of a demanding process essentially eradicates the hazard (e.g., eliminating the use of a hand-held bar code scanner for logistics/inventory management personnel by providing an automatic bar code scanner).

### *Engineering Control*

Ergonomic engineering controls redesign the worksite or equipment to fit the limitations and capabilities of workers. Equipment or worksite redesign typically offers a permanent solution (e.g., providing a computer workstation that can be adjusted to a wide range of anthropometric dimensions).

### *Substitution*

Substituting a new work process or tool (without WMSD hazards) for a work process with identified WMSD hazards can effectively eliminate the hazard. (e.g., replacing hand tools, which require non-neutral wrist positions—extreme wrist flexion, extension, and/or deviation—with tools that allow a neutral wrist posture).

### *Work Practices*

Practices that decrease personnel exposure to WMSD risks include changing work techniques, providing employee-conditioning programs, and regularly monitoring work practices. It also includes equipment maintenance, adjustment, and modification of current equipment and tools as necessary.

Proper work techniques include methods that encourage correct posture, use of proper body mechanics, appropriate use and maintenance of hand and power tools, and correct use of equipment and workstations.

Personnel conditioning refers to the use of a conditioning or break-in period of time. New and returning personnel may need to be gradually integrated into a full workload, depending on the job and on the person. Supervisors, trained ergonomics personnel, and health care personnel should identify those jobs that require a break-in period. Health care personnel should evaluate those personnel returning from a health-related absence and define the break-in period for each individual person.

Regular monitoring of operations helps to ensure proper work practices and to confirm that the work practices do not contribute to cumulative trauma injury or hazardous risk factors.

Effective schedules for facility, equipment and tool maintenance, adjustments, and modifications will reduce WMSD hazards. This includes ensuring proper working conditions, having sufficient replacement tools to facilitate maintenance, and ensuring effective housekeeping programs. Tool and equipment maintenance may also include vibration monitoring.

### *Administrative Controls*

Administrative controls can be used to limit the duration, frequency, and severity of exposure to WMSD hazards. Examples of administrative controls include:

Reducing the number and speed of repetitions by reducing line and/or production speed or by having personnel input into production speed (i.e., using personnel-based rather than machine-based production speed).

Providing rest breaks to relieve fatigued muscle-tendon groups. The length of the rest break should be determined by the effort required, total cycle time, and the muscle-tendon group involved.

Increasing the number of employees assigned to the task (e.g., lifting in teams rather than individually).

Instituting job rotation as a preventive measure, with the goal of alleviating physical fatigue and stress to a particular set of muscles and tendons. Job rotation should not be used in response to symptoms of cumulative trauma; this can contribute to symptom development in all personnel involved in the rotation schedule rather than preventing problems. Trained ergonomics and health care personnel should conduct an analysis of the jobs used in the rotation schedule.

Providing modified or restricted-duty assignments to allow injured muscle-tendon groups time to rest, which will assist in the healing process. Every effort must be made to provide modified- or restricted-duty assignments when physical limitations (as identified by a health care provider) allow a worker to return to work performing less than his or her normal work requirements. For modified- or restricted-duty assignments:

A health care provider should specifically identify assignments or job tasks for the individual person based on his or her symptoms, capabilities, and limitations.

Health care providers with specific knowledge in both occupational demands and cumulative trauma injuries should cooperative with trained ergonomics personnel to develop a list of jobs with low ergonomic risk.

Job descriptions for each modified-duty position should be written. The description for each modified-duty assignment should include ergonomic risk factors and muscle-tendon groups required to perform the job. Civilian personnel representatives and supervisors, in conjunction with health care personnel, should identify modified-duty assignments and tasks and write descriptions for these assignments and tasks that conform to documented requirements. A combination of tasks from one or more jobs can be used as a modified duty assignment.

### *Personal Protective Equipment (PPE)*

Personal protective equipment is not necessarily recommended for controlling exposure to WMSD hazards, as little research has been conducted to support claims of its usefulness.

Ergonomic appliances, such as wrist rests, back belts, back braces, etc., are not considered PPE. Consult with trained ergonomics personnel on the effectiveness of such devices prior to purchase.

Ergonomic hazards should be considered when selecting PPE. All PPE should be properly worn or used according to Department of Defense and manufacturers' specifications, available in a variety of sizes, should accommodate the physical requirements of personnel and the job, and should not contribute to WMSD hazards.

## Safe Lifting Techniques

Back injuries are common in physically demanding jobs that require lifting.

Hints for lifting to avoid injury:

- Share the weight.

The more people involved in lifting, the less force each needs to exert.

Don't over-estimate your strength and try to lift very heavy objects alone. It's not worth the risk of injury.

- If you are doing repetitive lifting, such as when palletizing equipment, lift with a partner or reduce the weight you lift. You can lift less weight repetitively than if you can in a single lift.
- Start the lift and end the lift between mid-thigh and chest (similar to the strike zone in baseball).

Waist height is the optimal position and puts the least amount of stress on the back and arms.

Avoid lifting from extremes (floor level and overhead).

Avoid reaching. Get as close to the object as possible.

- When storing objects:

Place the lightest objects on the lowest and highest shelves.

Place items that weigh the most on the middle shelves at waist height (in the strike zone).

- Twisting while lifting puts more tension on the disks and on the smaller muscles of the back. If the weights are relatively light, it shouldn't be a problem, unless the Servicemember will be doing repetitive lifts with twisting to the point of muscle fatigue and possible injury. Instead of doing repetitive lifts with twisting, use a cart or dolly, or do a straight lift and carry by a team.

## DoD Position on Back Belts

There is no evidence that back belts or back supports are effective in preventing low back pain or injuries. The Department of Defense has issued policy against their use for injury prevention. However the DoD does recognize them as *medical appliances* helpful for individuals with certain medical diagnoses.

The Department of Defense does not recognize back support belts or wrist splints as personal protective equipment, or the use of these devices in the prevention of back or wrist injuries. These devices are considered medical appliances and may be prescribed by credentialed health care providers who are responsible for medical clearance, monitoring and proper fit. (DODI 6055.1 August 19, 1998, p37)

## Slips, Trips, and Falls

Slips, trips, and falls are the number one cause of injury in the civilian sector. Within the Department of Defense, slips, trips, and falls are the second leading cause of injury, and the number one cause of brain injury. (Note: The leading cause of injury is vehicle or equipment operation.)

Injuries typically associated with falls are musculoskeletal strain injuries to the low back, ankle, or knee.

What causes falls?

- Elevation is one factor. Falls from a height often occur during deployments when Servicemembers jump off of tactical military vehicles. Tragically, falls from a height can be fatal.
- Falls can occur often when lifting or carrying something. Carrying an object decreases stability, and arms cannot be used for balance to prevent the fall to grab a railing or help break the fall.
- At home, falls on stairs often occur while carrying a child.
- Environment that contributes to hazards include uneven terrain, muddy or slippery terrain, and poor lighting.
- Rain, snow, and ice contribute to outside slips, trips, and falls.

Prevention measures:

- Use stair handrails – You can reduce the likelihood of a slip, trip, or fall by using handrails.
- Provide good floor friction – Put non-skid surfaces on floors. For example, carpeting can provide friction. Provide a mat to wipe feet when entering a building.
- Practice good housekeeping and maintenance – Keep pathways clear and dry. Clean liquid spills quickly. Fill cracks or holes in areas where Servicemembers walk or run. Provide adequate lighting.
- Use the three contact rule - When moving between vertical surfaces the three-contact rule should be applied. At each phase of the mounting and dismounting process, at least three limbs should maintain contact with steps or handles at the same time.
- Implement effective snow/ice removal program.
- Wear footwear appropriate for weather.

## Summary

- ✓ Apply ergonomics – fit the job to the person
- ✓ Be aware of risk factors (posture, repetition, duration, force, compression, vibration, and temperature) so that you make changes to reduce injury risk
- ✓ Know that whenever a person's physical abilities are exceeded, they are at risk for injury
- ✓ Use proper lifting – share the weight when possible
- ✓ Be aware that slips, trips, and falls are the second leading cause of injury in the military
- ✓ Be aware of the DoD position on back belts

Be proactive. When you see a problem, fix it. Don't wait for an injury to occur first. Injuries don't always happen after a minute or two of working in a challenging situation. Instead, they may occur after multiple repetitions of the same activities over extended periods of time, or when more than one risk factor is present.

Source: DoD Ergonomic Work Group

<http://usachppm.amedd.army.mil>

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